All the Water in the World

Grades
K - 3, 4 - 6

Objectives

- Recognize that there is a lot of water in the world, but that not very much of it can be used for our drinking water and other water supply needs.
- Recognize that ground water is a very small percentage of the earth's water.
- Understand how important it is that we take care of our ground water.

Interdisciplinary Skills

Science and Math

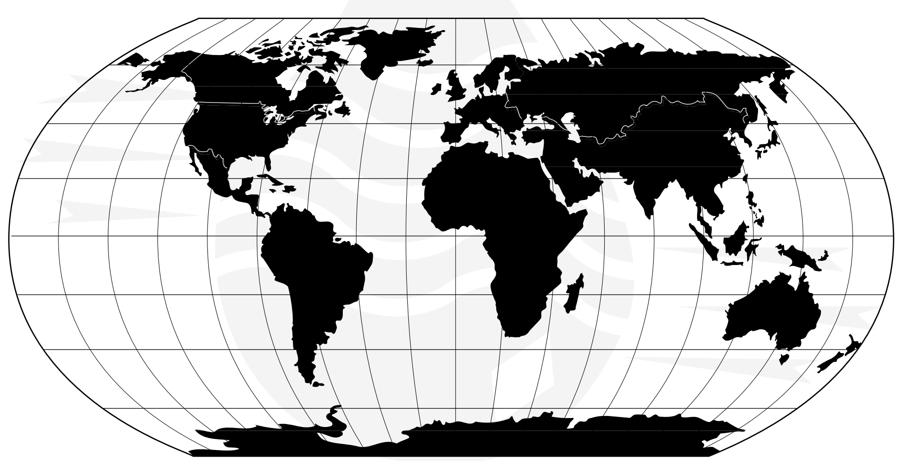
Estimated Time

- 30 minutes (grades K-3)
- 2 hours (grades 4-6)

Background Information

Because water covers three-quarters of the earth's surface, it might appear that there is plenty to go around and that we will never run out of this valuable resource. In reality, however, we have a limited amount of usable fresh water. Over 97 percent of the earth's water is found in the oceans as salt water. Two percent of the earth's water is stored as fresh water in glaciers, ice caps, and snowy mountain ranges. That leaves only one percent of the earth's water available to us for our daily water supply needs. Our fresh water supplies are stored either in the soil (aquifers) or bedrock fractures beneath the ground (ground water) or in lakes, rivers, and streams on the earth's surface (surface water).

We use fresh water for a variety of purposes. Agricultural uses represent the largest consumer of fresh water, about 42 percent. Approximately 39 percent of our fresh water is used for the production of electricity; 11 percent is used in urban and rural homes, offices, and hotels; and the remaining 8 percent is used in manufacturing and mining activities.



The Case of the Disappearing Water

Grades
4 - 6

➤ **Objectives**
- Demonstrate knowledge of the concepts of "evaporation."
- Explain evaporation in the context of the water cycle.

➤ **Estimated Time**
- 45 minutes to read and start the experiment
- 15 minutes to reach conclusions at the end of the experiment.

➤ **Materials**
- ❏ Clear measuring cups
- ❏ Water
- ❏ Copies of activity handouts

Background Information

The states in which water exists—***solid***, ***liquid***, and ***gas***—are often referred to as ***phases***. As heat is added or removed, water goes through a phase change. In its solid phase, water molecules are structured and orderly, in its gaseous phase water molecules lack structure and order.

In nature, the energy, or heat of the sun causes water to evaporate into its gaseous, or vapor, phase. Likewise, when we boil water over a burner we are causing it to change from a liquid to a gas. The process by which a substance changes from a liquid to a gas is called *evaporation*.

Water is continuously being heated and cooled—evaporating, condensing, freezing—depending on its environmental circumstances. As water travels its never-ending cycle between earth and sky, it encounters and mixes with a variety of substances. Some of these substances are ***pollutant***s in the sense that they are harmful to living things. Pollution can result both from natural sources and human activities.

Fortunately, through the water cycle, nature provides a variety of mechanisms for cleaning water. For example, evaporation is a natural water cleanser. When water evaporates, it leaves most dissolved substances and waste materials behind. Pollutants can also be filtered out when water moves through soil. Some pollutants settle out in slow-moving water bodies. Nature even employs a host of microscopic organisms to help keep water clean. Unfortunately, however, if pollutants remain in the environment, clean water can easily become polluted all over again as it moves through its cycle.

Teaching Strategy

1. Tell the students that they are going to be water detectives who are being asked to solve the case of the disappearing water.

2 Allow students to read the activity handouts.

3. Coach students as necessary, but encourage independent thinking as much as possible.

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4. Make sure students develop a hypothesis before beginning the experiment.
5. Make sure students remember to check the water level each day.
6. When the experiment is over, be sure the students record their results and conclusions.
7. Allow the students to work in small groups.

Follow-up Questions

1. For what reasons might the results of each group's experiment differ? *Environmental variables, e.g., one group's measuring cup may be exposed to more or less sun than the other's.*
2. Suppose that during the days Mrs. Flowers was gone the weather was sunny and hot; however, when the water detectives conducted their experiment, the weather was cloudy and cool. How would this variable affect the experiment?
3. What is a variable? *Something that is subject to change or variation; not constant.*

Alternate Strategy

- See "The Easy Evaporation Experiment" in this unit if you wish to perform this experiment without the story.

THE CASE OF THE DISAPPEARING WATER

by Susan M. McMaster

The Water Detectives Anonymous were called to the home of Mrs. Flowers. When they arrived on the scene, Mrs. Flowers' grown son, Frank Flowers, was frantic. His mother was missing! The detectives asked Frank how long his mother had been missing.

"That's just it," Frank said. "I've been traveling a lot and kept forgetting to phone her. Now I feel terrible. I have no idea where she is or how long she's been missing."

"Do you know of some places where she might have gone?" asked one water detective.

Frank wrinkled his brow and thought hard. "Well," he said, "her habits are very predictable. If she has been gone less than a day, she probably just went shopping. If she's been gone for less than 3 days, she may be visiting one of her sisters. She always says 'Guests are like fish, they start to stink in 3 days!' She would never visit anyone for more than 3 days."

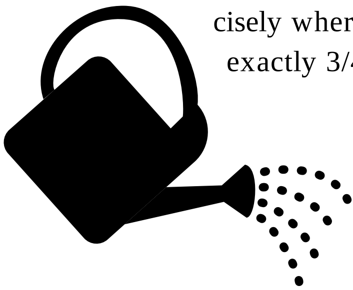
"If she's been gone more than 3 days, but less than 7," continued Frank, "she's probably taking a vacation on a cruise ship. I'm sure she can't afford more than a 7-day cruise. If she's been gone more than 7 days but less than 6 weeks, she's probably received the grant that she applied for—she wants to study art in Europe. If she's been gone more than 6 weeks, she is probably at her mountain cabin. However, she never stays there more than 2 months. If she's been gone longer than 2 months, aliens must have captured her and taken her to another galaxy. She loves her plants and her home. She would never stay away longer than 2 months for any reason.

"I think we can help you solve this mystery," said another water detective who had been looking around the house.

"Did you find a note?" asked Frank hopefully.

"No," said the detective, "but I did find this glass measuring cup in the window."

"Oh," said Frank, "that's nothing. Mother is very particular. Every morning she fills the measuring cup to exactly one cup. Then she puts it in the window sill to warm in the sun for a little while before she waters her African Violets. She is very careful about how much water she uses because she doesn't want to over-water or under-water the plants."



"Aha!" said the water detective, "Just as I suspected, this is precisely where we must begin our search. The measuring cup now has exactly 3/4 of a cup of water."

"Are you saying someone stole 1/4 of a cup of water?" asked Frank.

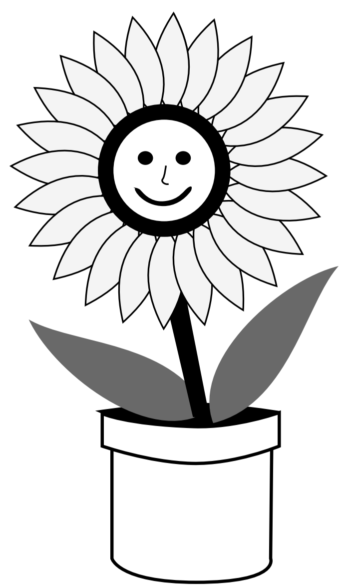
"No wonder his mother didn't bother to tell him where she was going!" muttered one of the detectives.

"No, sir," said another water detective, trying to keep a straight face. "It's a matter of evaporation. Ya' see, water evaporates into the atmosphere. The warmth of the sun changes the liquid into water vapor that we can't see. After awhile the water vapor condenses and forms into clouds. Eventually, the water comes back to the ground as rain or snow or hail. Over time, the water evaporates again. It's part of the water cycle."

"To make a long story short," said another detective. "We're going to conduct an experiment. We'll put a cup of water in a sunny place and keep track of how long it takes to evaporate. Based on that experiment, we will estimate how long ago Mrs. Flowers left the measuring cup in the window sill."

"What a relief!" said Frank. "What should we do now?"

"I suggest you water the plants," replied yet another detective.



THE CASE OF THE DISAPPEARING WATER

Step 1: Read "The Case of the Disappearing Water."

Step 2: Write down the facts of the case:

1. Original amount of water in the measuring cup ____________________.
2. Amount of water in the measuring cup now ________________________.

Step 3: Write down where Frank Flowers said his mother might be.

- If Mrs. Flowers has been gone for less than a day, she probably

  ____.

- If she's been gone for less than 3 days, she may be

  ____.

- If she's been gone more than 3 days but less than 7, she's probably

  ____.

- If she's been gone more than 7 days but less than 6 weeks, she's probably

  ____.

- If she's been gone more than six weeks but less than two months, she is

  ____.

- If she's been gone longer than two months,

  ____.

Step 4: Develop a hypothesis: (Tell what you think will happen before you do the experiment.)

1. How long do you think the water was left on the window sill?________.
2. Where do you think Mrs. Flowers went?__________________________.

Step 5: Perform an experiment to establish approximately how long it took for the water to evaporate.

Supplies:

- ❑ Clear measuring cup
- ❑ Water

Directions:

1. Write down today's date.__________
2. Fill a measuring cup to the 1-cup line.
3. Put the cup in a sunny window.
4. Record how many days it takes for the water in the measuring cup to be at the three/fourths cup line.

Step 6: Write your conclusions.

1. It took approximately _____ days for the water to evaporate.
2. Where should Frank begin looking for Mrs. Flowers? ________________
   ____.

Step 7: Make notes about your observations in your water detective's notebook:

____.

____.

____.

Supplementary Activities:

- Have students fill cups half full with water and then add other substances (e.g., food coloring, salt, mud). Set the cups in locations that are sunny and shady. Have students observe what happens to water in sunny versus shady locations and what happens to the substances in the water as the water evaporates.

Grades
K - 3

➤ **MATERIALS**

- ❏ Globe
- ❏ 97 pieces of uncooked ziti dyed blue, 1 piece dyed red, and 2 pieces dyed green or 100 dixie cups (optional strategy)
- ❏ Food coloring

TEACHING STRATEGY FOR GRADES K-3

Part A - Exploring the Globe

1. Look at the globe with the students. See if they can find where they live on the globe. Have them point out lakes, rivers, and oceans. Explain that these are called surface waters.
2. Ask the students if they know which kinds of waterbodies are salt water and which are freshwater. Have they ever tasted salt water? Was it good?
3. Ask the students if they think there is more water or land on the globe. Is there water beneath the surface of the ground that we cannot see on the globe?

Part B - Demonstrating With Ziti

1. Spread the ziti out on a table. Explain that there are 100 ziti pieces that represents all (100%) of the water in the world.
2. Using the concept of percentages, ask the students if they know what the red and green zitis represent. See if they can estimate percentages. Explain that the two green zitis represent water that is stored as ice in glaciers and at the poles (2%). The lonely red ziti represents the fresh water that is available for plants, animals, and people (1% of all the water on the earth). Ask the students what the remaining blue zitis represent. *They represent the water that's in the ocean, 97% of all the water on earth.*
3. Ask the students what we should do to take good care of the water we use in our homes and businesses. *Use only what we need.*

Optional Strategy

Use 100 dixie cups filled with water. Use food coloring (as described above) to indicate ice glaciers and fresh water.

Supplementary Activities

- ■ Draw a water pie. Have students draw a circle that represents all the water in the world. Have them make pie slices in the circle that represent 97% ocean, 2% glaciers and ice, and 1% fresh water. Color and label the water pie.

■ Make a water necklace. String the ziti (you'll probably need to have more on hand) on pieces of yarn. Have the students take the necklaces home and explain "all the water in the world" to their families.

Grades
4 - 6

➤ **MATERIALS**

- ❑ Globe
- ❑ 5 gallons of water
- ❑ Tablespoons
- ❑ Container (such as aquarium)
- ❑ Droppers
- ❑ Graph paper
- ❑ Small containers (quart jars)
- ❑ Copies of activity handout

TEACHING STRATEGY FOR GRADES 4-6

Part A - Exploring the Globe

Same as K-3

Part B - Aquarium Demonstration

As you do this experiment, stress that the amounts represent relative quantities of different types of water, not actual amounts.

1. Put 5 gallons of water in an aquarium or other container. Tell students to imagine the container represents all the water in the world.
2. Have students remove 34 tablespoons of the water and put them into a cup. Tell them this amount represents all the water in the world that is not ocean.
3. Have the students remove 26 tablespoons of water and then another 8 tablespoons of water from the cup containing the 34 tablespoons of water. Put each into separate cups. The 26 tablespoons represent the world's ice caps and glaciers. The 8 tablespoons represent the world's fresh water. A fraction of a tablespoon (1/10) represents the world's fresh water lakes and rivers. Of that, all rivers amount to less than a drop.
4. Be sure to recycle the water. Use it to water plants.

Part C - Work Sheet: All the Water in the World

1. Ask students to complete the activity work sheet.
2. The answers to the drinking water percentages: 0.419% total and 2.799% grand total.
3. Ask students if the numbers surprised them. Did they realize that such a small percentage of the water in the world is fresh?

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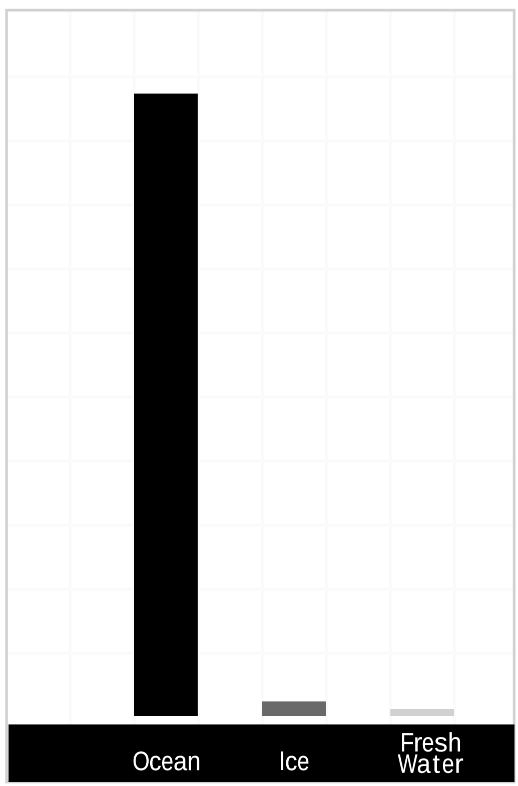
Part D - Bar Graph

1. Distribute graph paper.
2. Ask students to create a bar graph that shows 97% ocean, 2% ice caps and glaciers, and 1% fresh water.

Follow-up Questions

1. Why isn't all fresh water usable? *Some is not easy to get at; it may be frozen or trapped in unyielding soils or bedrock fractures. Some water is too polluted to use.*
2. Why do we need to take care of the surface water/ground water? *Water is very important for humans, plants/crops, and animals. If we waste water or pollute it, we may find that there is less and less of it available for us to use.*



Adapted from: Project Aquatic Wild. *How Wet is Our Planet?* Western Regional Environmental Education Council, 1987.

D I D Y O U K N O W . . . . ?

- ❑ Earth is called the water planet.

- ❑ Between two-thirds (2/3) and three-fourths (3/4) of the earth's surface is covered with water.

- ❑ The earth has different types of water:

Oceans	97.2% of total water
Ice caps/glaciers	2.38%
Ground water	0.397%
Surface water (e.g., lakes, rivers, streams, ponds)	0.022%
Atmosphere	0.001%

Add up the percentages for water available for drinking water.

Ground water ____________

Surface water ____________

Total ____________

Now add ice caps/glaciers ____________

Grand Total ____________

Remember: Only a small percentage of water is suitable for humans to drink. Not all of the water in the ground and in lakes and rivers is easy to reach or clean enough to drink. Ice caps and glaciers are certainly hard to use for humans, plants, and animals. Some work is being done to take the salt out of ocean water (desalinate the water), but that is an expensive process.

Adapted from: *Water: The Resource That Gets Used and Used and Used for Everything.* Poster: Middle School Version. United States Geological Survey, Reston, Virginia. 1993.

DEEP SUBJECTS—WELLS AND GROUND WATER

Grades
3 - 6

➤ **OBJECTIVES**

- Demonstrate knowledge about what ground water is in terms of how it exists in the ground.
- Explain how ground water moves through the soil and how it interacts with surface water.
- Demonstrate knowledge about how ground water is extracted for use as drinking water.

➤ **ESTIMATED TIME**

- Part A - 20 minutes
- Part B - 20 minutes
- Part C - 45 minutes
- Part D - 25 minutes
- Part E - 20 minutes
- Part F - 25 minutes
- Part G - 20 minutes

BACKGROUND INFORMATION

Water that falls to the earth in the form of rain, snow, sleet, or hail continues its journey in one of three ways: It might land on a waterbody and, essentially, go with the flow; it might run off the land into a nearby waterbody or storm drain; or it might seep into the ground. Water that seeps into the ground moves in a downward direction because of gravity, passing through the *pore* spaces between the soil particles, until it reaches a soil depth where the pore spaces are already filled, or saturated, with water.

When water enters the *saturated zone*, it becomes part of the *ground water*. The top of this saturated zone is called the *water table*. The water table may be very close to the ground surface, which is often the case when it is adjacent to a waterbody, or it may be as much as 200 to 600-feet deep, which is the case in many areas of the Southwest United States. A water-bearing soil or rock formation that is capable of yielding enough water for human use is called an *aquifer*. In bedrock aquifers, water can move through cracks, or fractures. Some types of bedrock—like sandstone—can absorb water like a sponge; other types of bedrock—like granite—do not.

How quickly water passes through, or *infiltrates*, the soil is a function of the size and shape of the soil particles, the amount of pore space between the particles, and whether or not the pore spaces interconnect. For example, soils that consist primarily of larger sand and gravel particles tend to have larger, interconnected pore spaces that allow water to flow easily and relatively quickly. In contrast, some soils, such as silts and clays, have poorly connected pore spaces, a soil structure which tends to slow down infiltration.

➤ **MATERIALS**

- ❑ Flip chart or black board
- ❑ Markers
- ❑ Clear plastic cups
- ❑ Pea-sized un-colored aquarium gravel (available from pet supply stores)
- ❑ Sand
- ❑ Water bottle spray nozzles (available from a hardware store)
- ❑ Pieces of nylon stockings or tights
- ❑ Cake pan(s) (glass is preferable) or a clear, plastic salad tray
- ❑ Water
- ❑ Food coloring (at least one teaspoon per gallon)
- ❑ Unsweetened red Kool-Aid
- ❑ "Rain cups" - paper cups with holes punched in the bottom
- ❑ Water Maze handout

Excuse Me, Is this the Way to the Drainpipe?

Grades
K - 6

Objectives

- Explain where drinking water comes from and where wastewater goes once it leaves the home.
- Explain how the water we use fits into the water cycle.

Interdisciplinary Skills

Reading, Art, Science.

Estimated Time

- K-3: 45+ minutes to read, discuss, and color story
- 4-6: 10 minutes to read story; 45 minutes to create water travel book

Materials

- ❏ Copies of the activity story
- ❏ Crayons (grades K-3)
- ❏ Paper and art supplies to make travel book (grades 4-6)

Background Information

We seldom think about where the water we use in our homes or businesses comes from or where it goes once it disappears down the drain. The water we use everyday is very much a part of the earth's water cycle and is continually recycled. When we use water we are, essentially, detouring it from its natural cycle and then, in short order, returning it back to the environment.

Water can dissolve, suspend, and transport many substances. Therefore, the quality of the water we drink has a lot to do with where it has been and what has been in contact with it. For this reason, our water supply sources are not always drinkable and may need treatment to remove natural or manmade contaminants. All drinking water must meet federal and state standards that were put in place to ensure that the water is safe to drink. Needless to say, protecting our water from harmful contaminants to begin with, is important.

Our ***drinking water*** comes from either ground water (e.g., wells, springs) or surface water (e.g., rivers, lakes, manmade reservoirs). Ground water supplies are usually extracted by a pump, treated and disinfected when necessary, and delivered to homes and businesses through a network of pipes called a ***distribution system***. Many people who live in rural areas have individual, on-site ground water wells with very simple piping systems; many other people who depend on ground water, but live in more populated areas, receive their water from large water supply wells with more complicated distribution systems.

Surface water supplies are withdrawn from rivers, lakes, and reservoirs through large intake structures. The water is disinfected and often treated at a ***water treatment facility*** to remove impurities before entering the distribution system. Surface water supplies often travel through many miles of underground pipes before reaching the faucets of people's homes and businesses.

Clean drinking water comes into our homes through one set of pipes and leaves our homes as ***wastewater*** through another set of pipes. The dirty wastewater that is flushed down the drain from our homes and businesses must be treated so that it can be safely and effectively recycled back to nature.

THE CASE OF THE MYSTERIOUS RENTERS

Grades
4 - 6

OBJECTIVES

- Identify ways in which water is used.
- Determine how much water families use each day.
- Recognize the importance of conserving water.
- Determine ways in which water can be conserved.

INTERDISCIPLINARY SKILLS

Science, Mathematics, Critical Thinking

ESTIMATED TIME

- Part A - 10 minutes to explain the chart; 30 minutes for follow-up discussion after the survey has been completed.
- Part B - 20 minutes

MATERIALS

- ❏ Copies of activity handouts (3)

BACKGROUND INFORMATION

As we have traveled through this ground water curriculum, students have learned about the inestimable value of water, its characteristics, how it moves through our world and our homes and businesses in a vast cycle, and how it can become polluted. In this final section of the curriculum, we would like students to recognize their own ability to make a difference in conserving and protecting our water resources.

Gifford Pinchot, an American conservationist and politician who served as chief of the U.S. Forest Service between 1898 and 1910, referred to conservation as “The wise use of the earth and its resources for the lasting good of men.” The conservation of our water resources depends on our wise use of these resources. Such wise use, without a doubt, begins at home.

It is only recently that environmental issues and our interrelationship with the natural world have been integrated into school curricula. In this sense, our teachers and our children are our environmental emissaries, getting the word out to families and friends that we are all responsible for protecting and maintaining our earth for today’s and future generations. The final four activities in this curriculum serve as first steps in what we hope will be a life-long commitment to water *stewardship*.

TEACHING STRATEGY

Part A-Detective Work

1. Tell students that today they are going to be water detectives who have been called in to solve a case of mysterious renters.
2. Distribute the copies of the case story and survey.
3. Be sure students write down their hypotheses before completing their surveys.
4. Explain how to fill out the survey. Explain how to make tally marks each time the activity takes place. Ask students to ask their families to help complete the survey for one day—families can become more aware of how much water they use in the process. A weekday, when families have more of a routine, will

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provide the best picture of daily water use. (It might be interesting, for extra credit, to compare weekday and weekend water use.)

5. After students have completed the survey, discuss the results.

Alternate Strategy

- If the story is too complicated for some students, try the previous activity, "Conserving Daily Water Use at Home," which accomplishes the same purpose and is designed for younger students.

Part B - Brainstorming About Water Conservation

1. Have students look at their water use surveys. Ask them to consider what their families could do to reduce the amount of water they use. How much water would that conserve? If everyone in the class followed that practice, how much water would it save in a year?
2. Are there ways to conserve water that would not be a good idea (e.g., not brushing teeth or washing)?
3. Give each student a copy of the "Water Conservation Tips" activity handout. Look it over as a group to see how it compares with your list. Suggest that students take it home and post it in the bathroom or kitchen.

Supplementary Activities

- Have students write an article for the school newspaper listing ways people can conserve water.
- Have students write a brief newsletter for their parents reporting on the results of the survey. (Don't mention names, except to honor those who used the least amount of water per person.) Include water conservation suggestions.

THE CASE OF THE MYSTERIOUS RENTERS

Scenario:

Mrs. Jackson has called the water detectives to help her solve a serious problem. She has heard that the detectives have an excellent record for solving mysteries.

"What seems to be the problem?" asked one of the water detectives.

"Well," said Mrs. Jackson, "as you know, I rent out several apartments to college students. I never allow more than four students to stay in one apartment. But, in Apartment 319, I know there are more than four people, I just can't prove it."

One of the water detectives interrupted her with a question, "Have you ever tried making surprise visits?"

"Yes," she answered, "but every time I go there, four people or less are at home. Those college students come and go at all hours of the day and night. There is no way for me to keep track of how many students actually share the apartment."

"Very interesting," said one of the detectives. "I think we can help you, but first we'll need to see last month's water bill for the apartment."

"How will that help?" asked Mrs. Jackson.

"We'll be able to see how many gallons of water were used last month," said another water detective.

Mrs. Jackson found the bill. It revealed that last month the occupants used 15,000 gallons.

"Let's see," said one of the detectives. "Last month was September, which has 30 days. If we divide 15,000 gallons by 30 days, we know that they used 500 gallons a day."

"Yes," said Mrs. Jackson, "but is that a little or a lot?"

"We'll have to investigate and get back to you. We'll do a survey to find out how much the average person uses," said the detective.

With that, the water detectives left Mrs. Jackson with a promise to return soon with an estimate of how many people are sharing the apartment. The water detectives decided that they needed to do some research to determine how much water people use in one day. In order to come up with an estimate, they decided to find out how much water their own families use in one day. Here's how:

Step 1: Record the facts of the case.

- The people in the apartment used _______________ gallons of water in September.
- September has ________ days.
- The average number of gallons of water used per day was ___________ gallons.

Step 2: Form a hypothesis.

How many gallons of water a day do you think a person uses?

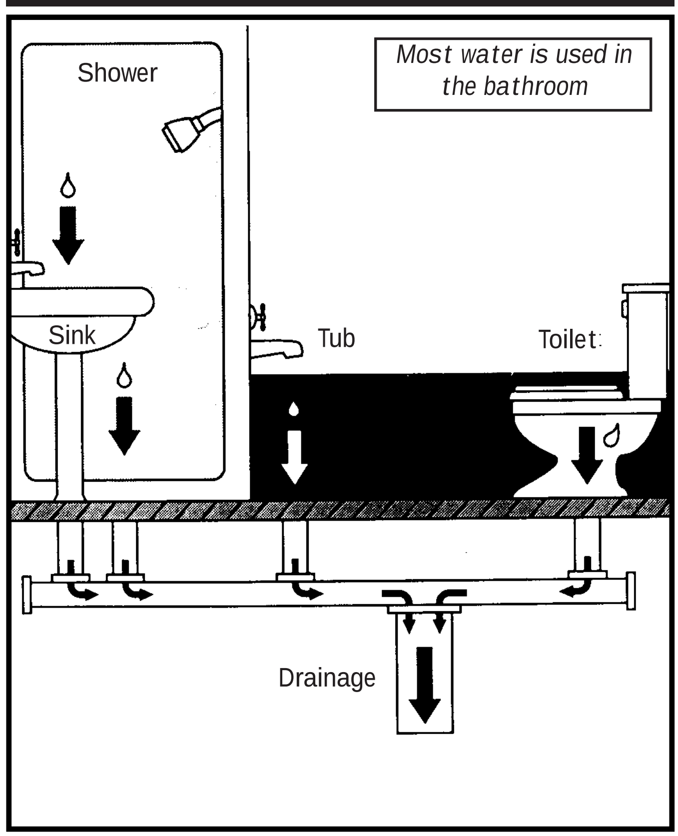
________________ gallons

Step 3: Fill out the water survey.

Step 4: Record your conclusions.

1. How many total gallons of water did your family use in one day? ______________ gallons
2. How many gallons of water per person per day did your family use? ______________ gallons
3. Based on your results, how many people do you think are living in Mrs. Jackson's apartment? ______________
4. Compare your answer with the answers of others in your class.

WATER USE IN THE BATHROOM



HOW MUCH WATER DO YOU USE?

Directions:

We are doing a water survey to find how much water we use in one day. Place a tally mark in the Times/Day column every time someone in your family does the activity.

			Times/Day		Total
Toilet Flushing	5 gallons	x	____________	=	____________
Short Shower	25 gallons	x	____________	=	____________
Tub Bath	35 gallons	x	____________	=	____________
Teeth Brushing	2 gallons	x	____________	=	____________
Washing Dishes with running water	30 gallons	x	____________	=	____________
Washing Dishes by filling a basin	10 gallons	x	____________	=	____________
Using Dishwasher	20 gallons	x	____________	=	____________
			Grand Total	=	____________

NOTE: Washing clothes in a washing machine is not included in these calculations—a typical wash cycle uses 40 gallons of water. Another significant seasonal water use is lawn and garden watering. This survey deals with daily water use in the home, but most of us use additional amounts of water at school, at work, and other places throughout the day.

To find average use per person in your family, divide the grand total by the number of people in your family. The answer is: ____________________________

Follow-up Questions:

1. In your home, which activity happened most often?__________________

____

2. Which activities use the most water each time they occur? ____________

____

3. What other activities at home consume large amounts of water? ______

____

DID YOU KNOW THAT ALL WATER IS RECYCLED?

We drink the same water that the dinosaurs did, and future generations will drink that same water. That's why it's our job to use water wisely and protect water supplies whenever and wherever possible. If we each save a small amount of water each day, our combined savings will add up to millions of gallons each year.

Water saved is money saved! Water conservation can save on water and sewer fees. Also, when you use less water, your fuel bills are lower. Even if you use well water, saving water reduces both electric costs and the waste load going into your septic system.

WATER CONSERVATION TIPS

Bathroom

Two thirds of the water used in the average home is used in the bathroom, mostly for flushing toilets, showers, and baths.

- ☑ **Turn off the water when you are not using it**—don't let it run while you brush your teeth or shave.
- ☑ **Flush the toilet less often**—put used tissues, trash, hair, paper towels, etc. in the wastebasket instead of flushing them.
- ☑ **Fix leaks and drips**—this is often simply a matter of changing a washer.
- ☑ **Retrofit older plumbing fixtures with flow-reducing devices.**
- ☑ **Take shorter showers**—less than 5 minutes is adequate, any longer is recreation.
- ☑ **Take baths**—a partially filled tub uses less water than a shower.

Kitchen and Laundry

- ☑ **Use appliances efficiently**—run full loads in the dish or clothes washer or, if your appliance has one, use a load selector.
- ☑ **Buy a water saver**—select new appliances that are designed to minimize water use.
- ☑ **Clean vegetables and fruit efficiently**—use a vegetable brush to expedite cleaning.
- ☑ **Use garbage grinders as little as possible**—start a compost pile or give leftovers to a dog, cat, chicken, horse, etc.
- ☑ **Keep a bottle of drinking water in the refrigerator**—avoid running the tap just to cool water for drinking.

Lawn and Garden

- ☑ **Water the lawn and garden only when necessary**—early morning or evening are the best times. Let grass grow higher in dry weather. Mulch your trees and plants. Avoid watering driveways and sidewalks.
- ☑ **Deep-soak your lawn**—allow the moisture to soak down to the roots where it does the most good. A light sprinkling evaporates quickly.
- ☑ **Plant drought resistant trees and plants**—many beautiful trees and plants thrive with less watering, particularly native species.
- ☑ **Wash your car sensibly**—Clean the car with a pail of soapy water and use the hose only for a quick rinse.

CAN YOU THINK OF OTHER WAYS TO CONSERVE WATER AND PROTECT YOUR WATER SUPPLY?

NOTES

In rural areas, wastewater pipes are hooked up to small on-site sewage treatment and disposal systems, or *septic systems*, that are buried in the ground. In these systems, wastewater generally flows by gravity through a pipeline that runs from the home to a septic *tank*, where wastewater is partially treated before it flows onward to a *leaching system*. As wastewater passes through the leaching system (a buried network of pipes with holes through which the water passes) it is further filtered and treated by the soil and the microorganisms in the soil. Eventually, the treated water seeps into the ground water.

In more populated areas, wastewater in conveyed from the home into a network of sewer lines which lead to a *wastewater treatment plant*. Here, wastewater is cleaned by mechanical, biological, and chemical processes before it is discharged into ground water or surface water. Water that is discharged from wastewater treatment facilities must meet stringent federal and state standards.

Both septic systems and large wastewater treatment systems rely on small, *microscopic organisms* (e.g., bacteria) to help clean up water. These organisms, nature's own built-in water purifiers, devour and digest organic waste material in the wastewater. The more efficiently the organic solids are digested, the cleaner the water. This is a big reason why it is important not to flush harmful substances, such as household hazardous wastes, paints, paint thinners, and drain cleaners, down the drain. These substances can kill natually-occurring bacteria, especially in septic systems, and cause the systems to function poorly.

TEACHING STRATEGY: GRADES K-3

1. Hand out copies of the story. For classes with pre-readers or early readers, read the story to the students. Discuss the story, ask questions, and show the students the pictures as you go along. (The art activity in the "Follow Those Pipes" activity can help students visualize what this story is describing.) Have older students read the story themselves and then have a discussion.

2. Discussion questions: Ask the students whether they think their water comes from a well by their home or whether it is piped in from somewhere else. If their water comes from somewhere

NOTES

else, do they know from where? Does their wastewater go to a septic tank or a wastewater treatment plant? Does Martha live in the city or the country? Ask the smaller children what parts of the story they think couldn't happen and what parts are true.

3. Have the students color the pictures in the story and take it home to share with their families.

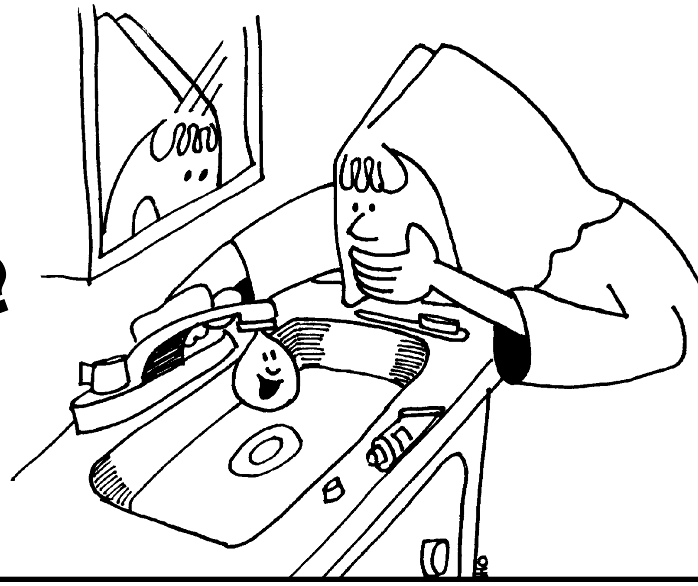
TEACHING STRATEGY: GRADES 4-6

1. Distribute copies of the story.
2. Have students read the story on their own. (The art activity in the "Follow Those Pipes" activity can help students visualize what this story is describing.)
3. Discuss the story. Ask the students whether they think their water comes from a well by their home or whether it is piped in from somewhere else. If their water comes from somewhere else, do they know from where? Does their wastewater go to a septic tank or a wastewater treatment plant? Does Martha live in the city or the country? In the city, where is the water cleaned to make sure it is safe enough to drink? In the city, where does the water go after people have used it?
4. Have the students create a "Willy Wetsworth Travel Book" that shows their own ideas about what a good travel adventure for a water drop might be. Make sure students show how the water gets from one place to another and in which phases (liquid, gas, solid).

Supplementary Activities

- Take the class on a field trip to a water and/or wastewater treatment plant.
- Invite a member of your local water or wastewater department or a plumbing contractor to be a guest and explain how water comes into and leaves homes and businesses.

Excuse Me, Is This The Way To The Drainpipe?



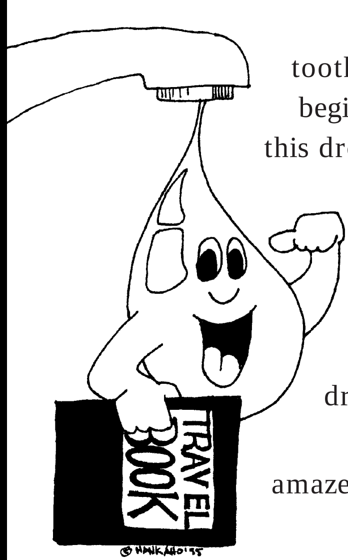
by Ellen Frye

illustrations by Hank Aho

Martha Merriweather forgot to brush her teeth. She'd already said goodnight to her mom and dad, to Benji, her brother, and Lulu, her parakeet. She was all snug under her red polka dot blanket. In fact, she was pretty near asleep when she remembered about her teeth.

It had been one of those days—one of those forgetting days. She forgot her lunch and had to borrow lunch money from Mrs. Johnson in the school office. She forgot her homework assignment and had to call her friend Terry to find out what it was. She'd even forgotten to feed Lulu until her mother reminded her.

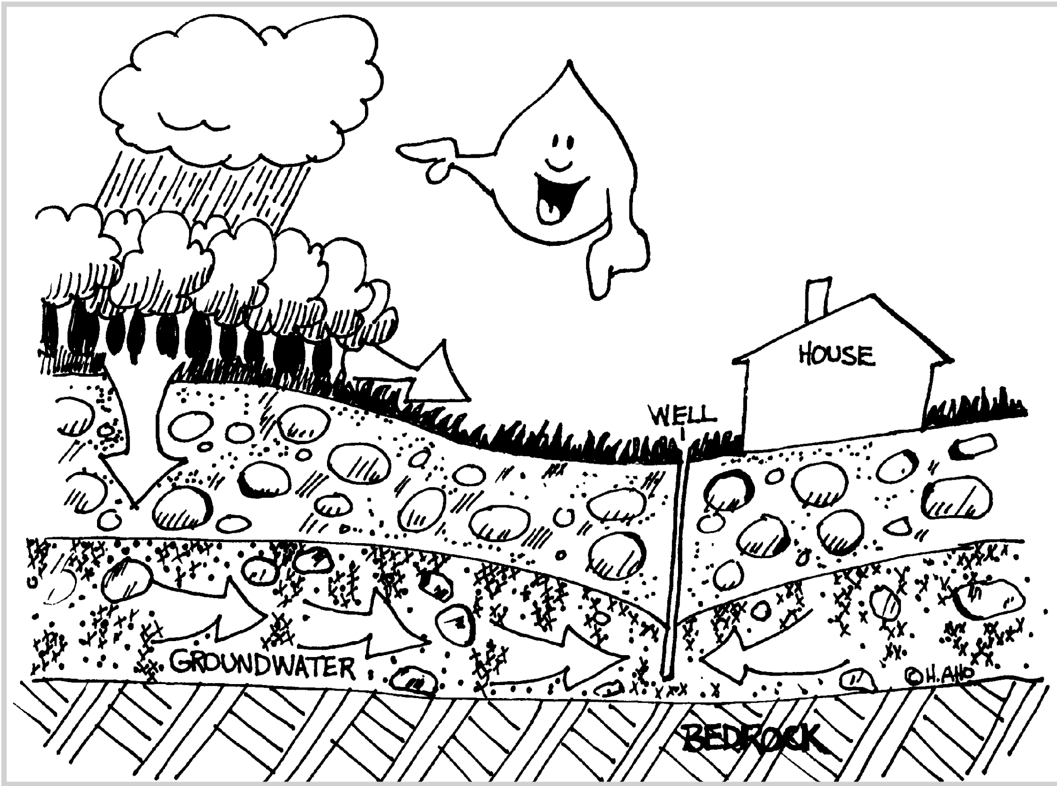
But Martha Merriweather did finally remember to brush her teeth. So she got out of bed, headed to the bathroom, turned on the light, picked up the toothbrush, picked up the toothpaste, put the toothpaste on the toothbrush...



But, just as Martha was bringing the toothbrush with the toothpaste to her teeth, she noticed a drop of water that was just beginning to drip from the faucet—which isn't so very unusual. But this drop didn't drip and it didn't drop; instead, it seemed to get bigger...and bigger. Furthermore, it seemed to be waving to her. Yes, it was waving to her. In fact, it seemed to be speaking to her. Yes...yes, it was speaking to her. In fact, it was asking her a question.

"Excuse me, is this the way to the drainpipe?," the drop was asking as it pointed to the drain in the sink.

"Yes it is," answered Martha, her eyes wide open with amazement. "But...but....you're talking!"



"Yes," said the drop, "I often talk when I have a question, and, if you recall, I did have a question! You see," he said, "my travel book says that I should flow from the Merriweathers' ground water well, continue on up through the Merriweathers' water pipes, until I get to the Merriweathers' bathroom faucet. At that point, my travel book says, I should dive downward to the Merriweathers' drainpipe."

"Merriweather?," cried Martha, "Merriweather? That's my name—Martha Merriweather."

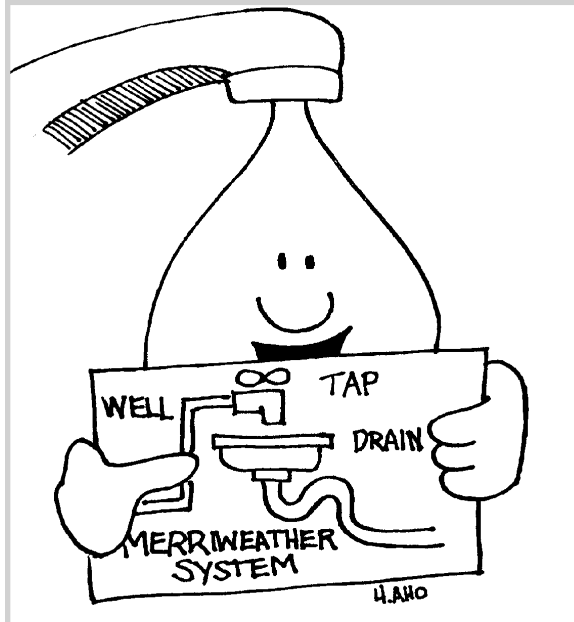
"And my name is Willy Wetsworth, a traveler and adventurer," said the drop. "Pleased to meet you."

"A traveler and adventurer?," whispered Martha gleefully.

"Yep," said Willy Wetsworth, "I spend my life traveling—in the clouds, in the sky, in the rivers, oceans, and streams, along the roadways, through the woodlands and grasslands, down in the soil, and between the rocks. Today, I'm traveling through water pipes—your water pipes. I was just pumped up into your house from the well in your backyard. It was a fun-foodling ride. Up, up, up, up, from the ground, then through this pipe and that pipe, until...well....here I am."

"Wow!," said Martha, trying to imagine what it would be like to travel in water pipes. She thought it might be "fun-foodling" if she were wearing a snorkel and flippers. She thought it might be like zooming through a water slide at the amusement park.

“Do you mean to say,” she asked, “that any time people brush their teeth, or wash their hands, or take a shower, or wash the dishes, or do the laundry, or flush the toilet, or water the flowers...that all that water has just had an exciting ride through the pipes?”



“Yep,” replied Willy.

“Do you mean to say that all the water that people use comes right from a well in their own backyard?,” asked Martha.

“Well...sometimes yes, and sometimes no,” replied Willy. “It says here in my travel book that some people, like the Merriweathers, live in the country where there are more trees than people, and where houses are spread apart. So when people who live in the country need water, they can usually get it from the water deep in the ground in their own backyard. But it’s different in the city—the city’s where there are more people than trees, and buildings are closer together. City water is usually piped in from a big well, or a lake, or a stream, or a reservoir that might be right near by or it might be many miles away. I have a friend who actually made the trip through city water pipes.”

“Really?,” asked Martha

“Yes,” said Willy, “he started out at a big reservoir. From there he went through a big pipe to a water treatment plant.”

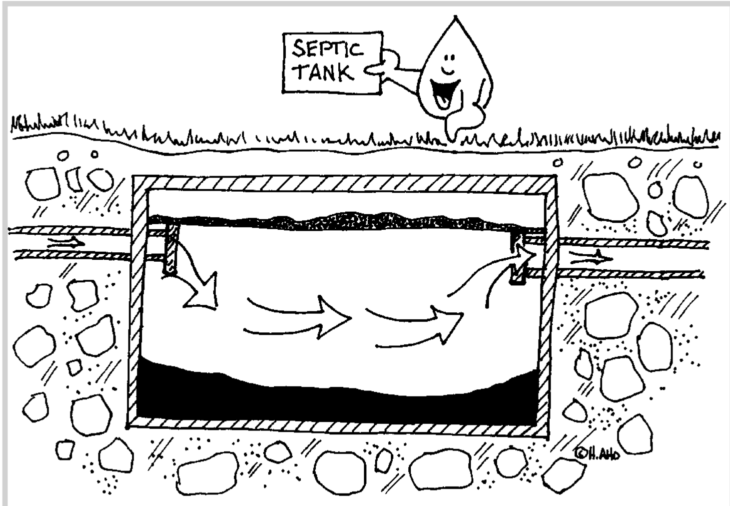
“A water treatment plant?,” asked Martha. “What’s that?”

“According to my friend,” said Willy, “it’s a place where water is cleaned so it’s safe enough for people to drink.”

“You mean your friend isn’t safe to drink?” asked Martha.

“Well he probably is,” said the drop. “But, in our travels, we water drops never know what we’re gonna run into—or what’s going to run into us. Let’s face it, every living plant and animal on this earth needs us and uses us—people boil us, drink us, mix other stuff with us, throw their scumdiddle glunk in us. There are so many ways we can get dirty. Most days, mother nature can clean us up without anybody’s help. But sometimes mother nature can use some help and a water treatment plant does just that—it’s kind of like mother nature’s little helper. My friend said it was really weird going through the treatment plant, but he felt good as new by the time he got out of there. But then...,” continued the drop.

“But then what?,” asked Martha, who by now was trying to decide whether or not she would like it if *she* were a water drop.



“Then he took a wondrous, long, rip-snoodling ride through some great big pipes, and then some medium-sized pipes, and then some smallish pipes, right into an apartment house,” said Willy. “Other water drops went to other places like office buildings and stores and museums and libraries. And then...”

“And then what?,” gasped Martha, thinking that, indeed, it might be fun to be a water drop.

“Then,” said Willy Wetsworth, “the people who live and work in those buildings turned on their faucets and used their water for something or other—like brushing their teeth.”

“Oh,” said Martha, looking at the toothbrush and toothpaste she was still holding. “I was just about to brush my teeth when I met you.”

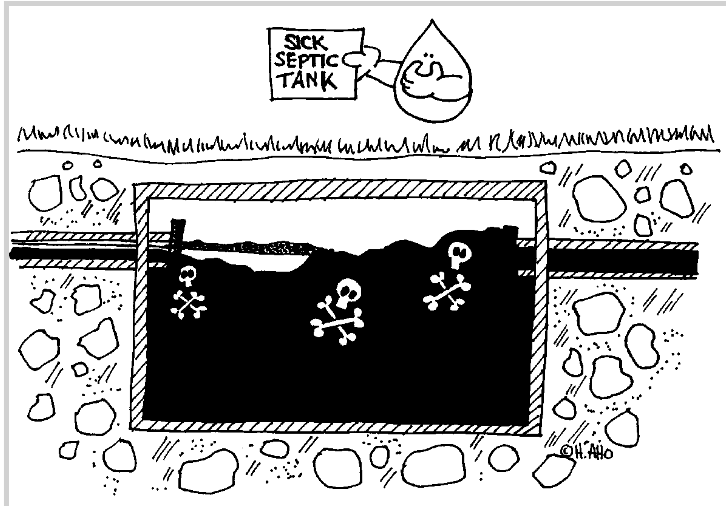
“And I was just heading for the drain,” said Willy.

“But you mustn’t,” blurted Martha, who had already grown rather fond of the drop. “I mean...down the drain? What on earth will happen to you?”

“Well, it says right here in my travel book that I’ll wash down another set of pipes and end up in a septic tank that’s buried in the Merriweathers’ backyard.”

“A septic tank?,” exclaimed Martha. “I’ve heard of that. A man came to clean our septic tank a little while ago, and when I asked my mother what a septic tank was she told me that it was a big box that holds our dirty water after it goes down the drain. She said it helps make the water clean again. The dirty water stays in the septic tank for awhile and then goes into another pipe and then it goes into the ground.”

Martha thought for a moment and then asked Willy, “Are you sure you really want to go down the drain to a septic tank? It sounds yucky!”



"It's not so bad," said Willy. "My travel book says the Merriweathers take good care of their septic system, so it does a good job of cleaning us up. My book also says the Merriweathers don't throw all kinds of nasty scumdiddle glunk down the drain that might make my friends down in the septic tank sick."

"You have friends in the septic tank?," asked Martha.

"Yep," said Willy. "heaps and gobs of eency, beency, plump, and jolly bacteria—mother nature's little cleaner uppers. They live in the septic tank and love to eat the waste in your wastewater."

"Ick," thought Martha.

"They eat it and digest it and eat it and digest it," said the drop, "and, like magic, they change it from harm*ful* waste to harm*less* waste."

"Wow!," exclaimed Martha.

"But like I said," said the drop, "my bacteria buddies get sick when people throw nasty scumdiddle glunk down the drain."

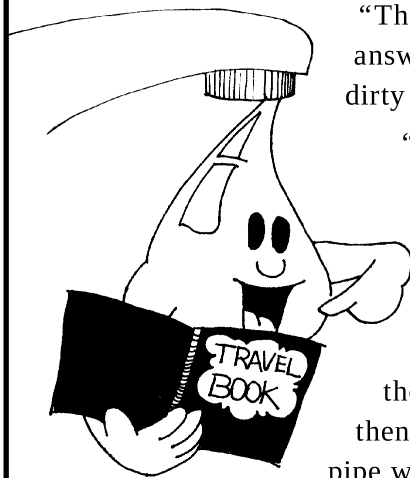
"What kind of scumdiddle glunk?," asked Martha.

"Oh, like paint thinner or plastics or oils or pesticides," said the drop.

"Oh," said Martha, who was beginning to think that being a water drop might not be as much fun as she thought. "I can't say that I've ever thrown any glunk down my drain, and I know now—for certain—that I never will!"

"Hooray for you, Martha Merriweather!," shouted the drop. "As you know, I thrive on adventure, but I've heard there are some septic systems that even I wouldn't want to visit. Some people just don't take care of them and, after awhile, they clog up and bog down and then my bacteria friends are anything but jolly. And then, of course..." said Willy, his smiling face giving way to a deep, dark frown.

"And then, of course what?," asked Martha, almost afraid to hear the answer.



"Then, of course, we water drops stay dirty, dirty, dirty," he answered with a shudder, "too dirty for anyone to drink...too dirty for brushing anyone's teeth."

"Oh," sighed Martha.

"But I'm going down that drain Martha Merriweather," Willy laughed and pointed to the drain. His face was once again lit up like the Fourth of July. "And if I get a little dirty and smelly in the septic tank, so what? Everybody gets dirty and smelly sometime. Down there in the septic tank, I'll hang out with my friends for a while and then, like you said, I'll float out of the tank and into a pipe—a pipe with holes in it," he said.

"It says right here in my travel book," Willy began reading from his book, "You will float out of one of the holes in the pipe and sink down into a big gravely place. From there, just relax and enjoy your journey into the soil below. Here in the soil you will find yourself getting cleaner and cleaner and cleaner and cleaner. In time, you will find yourself back in the ground water, not far from where your little adventure began." Willy smiled a big, wide smile and closed his book.

Martha asked Willy if his friend in the city had gone into a septic tank when he went down the drain.

"Oh no," replied Willy. "There's no room for septic systems in cities. Your septic tank is only a short trip from your house, but in the city, all the dirty water that goes down the drains of all the apartment houses and businesses travels through oodles upon oodles of pipes—smaller-sized, then middle-sized, then bigger-sized pipes that are buried under the streets. All that dirty water ends up at a flumongous, magrungous wastewater treatment plant."

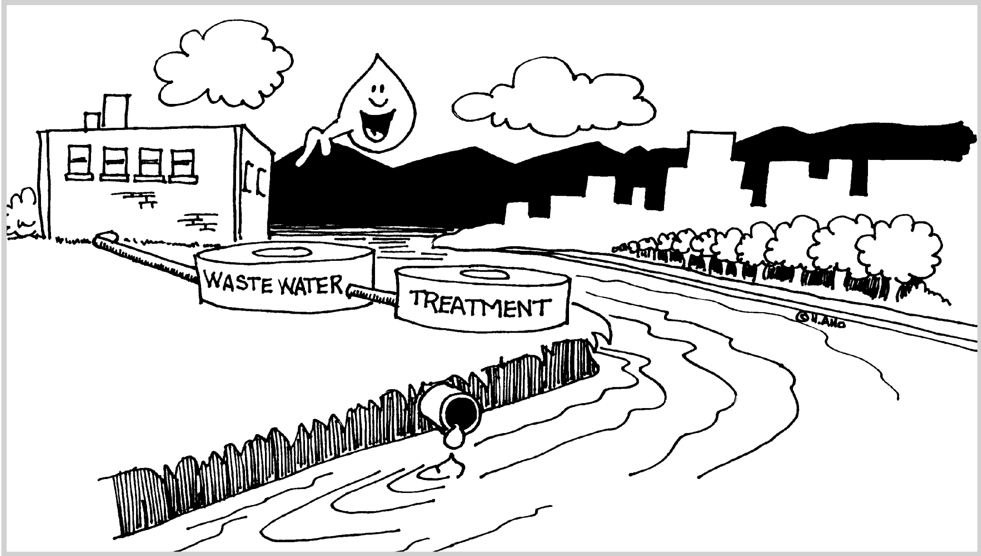
"Another treatment plant?," asked Martha.

"Another treatment plant," replied the drop, "but this one is called a wastewater treatment plant. A wastewater treatment plant is a place where dirty water that's flushed down drains and toilets gets cleaned up so that it's clean enough to go back into a nearby river, lake, stream, or ocean. Yep, my friend flowed into the wastewater treatment plant. He flowed from one big, flumongous tank to another getting cleaner and cleaner."

"Were there heaps and gobs of eency, beency, plump, jolly bacteria to help him get clean?," asked Martha.

"As a matter of fact, there were, Martha Merriweather, jillions and scillions and gadrillions of them. They were eating and digesting and eating and digesting...they ate so much," laughed Willy, "that after awhile they just sank to the bottom of the tank and took a nap."

"Took an nap?," giggled Martha.



“Yep,” laughed the drop. “And, guess what they did next?”

“What?..What?,” cackled Martha. “What did they do next?”

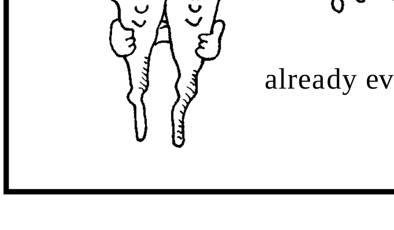
“They woke up and started eating and digesting all over again,” roared the drop, swinging gleefully from the faucet. Martha was laughing gleefully too—she couldn’t help it—although she wasn’t sure which was funnier, the thought of jillions and scillions of plump and jolly bacteria having a giant feast or seeing a drop of water named Willy laughing himself silly.

“And what happened to your friend?” asked Martha, trying to calm her giggles down.

“Then,” said the drop, trying to calm his giggles down, “then he splashed out of the treatment plant and into the Witchywatchy River. That’s where I met him—in the Witchywatchy River. We spent one cold January as icicles on the bank of the Witchywatchy River.”

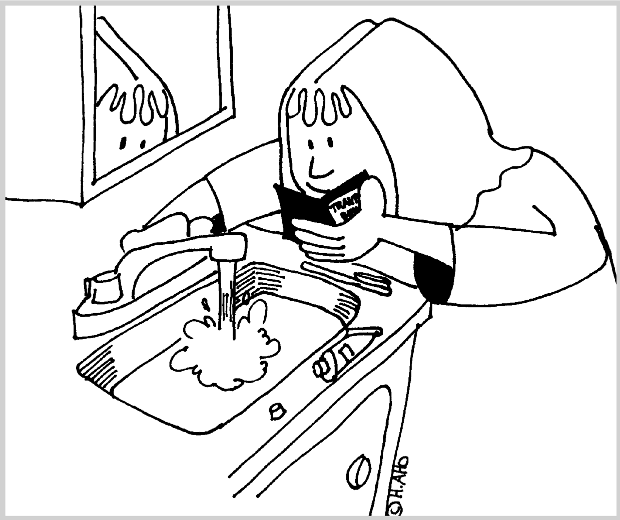
“Icicles?,” shivered Martha. “Weren’t you cold?”

“Nah,” answered the drop. “We’re water. Sometimes we float and flow as a liquid, sometimes we freeze into ice, and sometimes the heat makes us evaporate into the air as a vapor. It’s fun-foodling Martha Merriweather...fun-foodling. But now,” checking his waterproof watch, “I really must be moving on down the drain, and I think you must be brushing your teeth.” He noticed a big, wet tear well up in Martha’s eye and slide slowly down her face.



“Hey, hey, Martha Merriweather, I see a friend of mine sliding down your face—Tina Teardrop’s her name. When I see Tina Teardrop I know somebody’s sad. Are you sad?”

Martha felt her cheek for Tina Teardrop, but Tina had already evaporated into the air. “Must you go?,” she asked. “I could



keep you with me in a special, special little jar...” But Martha knew that a jar would be a very bad place for a traveler and adventurer. “Will I ever see you again?,” asked Martha.

“Of course you will,” smiled Willy. “Whenever you turn on your faucet, or catch a snowflake in your hand, or see the frost on your windowpane, or watch the mist rise from your spaghetti water, or swim in a swimming pool, or watch a flower grow—I’ll be there. I’m always here, Martha Merriweather. But if I were to become too dirty, even you wouldn’t want to have me around. So make sure you let your friends and family know that we water drops need to stay clean—for the sake of all the people and animals and flowers and trees in the whole wide world. So, S.Y.L., Martha Merriweather.”

“S.Y.L.?,” puzzled Martha.

“See Ya Later,” laughed Willy. “See Ya Later, Martha Merriweather,” he waved and winked.

“S.Y.L., Willy Wetsworth,” whispered Martha.

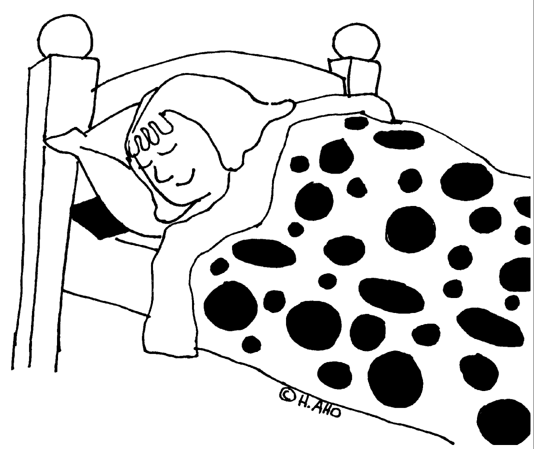
And, before her very eyes—right before her eyes—Willy got smaller and smaller until he was simply and purely a drop at the faucet. But, he’d left something behind. And what do you think it was?

He left his travel book with all the pictures of pipes and wells and ground water and ponds and lakes and oceans and glaciers and raindrops and snow flakes and...

Martha picked up the little book and opened it to the first page. And what do you think she saw?

She saw a little message. It said, “To my friend Martha Merriweather. From your friend, Willy Wetsworth.” That’s what it said.

As Martha brushed her teeth, she watched the foamy water wash down the drain, knowing that Willy was on his way to another adventure. She turned the water off, put her toothbrush away, and returned to bed. She crawled under her polka dot blanket, then she took the travel book and tucked it carefully under her pillow. It had been quite a night...a FUN-FOODLING NIGHT!



DEEP SUBJECTS—WELLS AND GROUND WATER

NOTES

When infiltrating water reaches the water table, it begins to move along with the ground water flow, which tends to follow a downhill, or down slope, direction. Compared with water in rivers and streams, ground water moves very, very slowly, from as little as a fraction of a foot per day in clay to as much as 3-4 feet per day in sand and gravel.

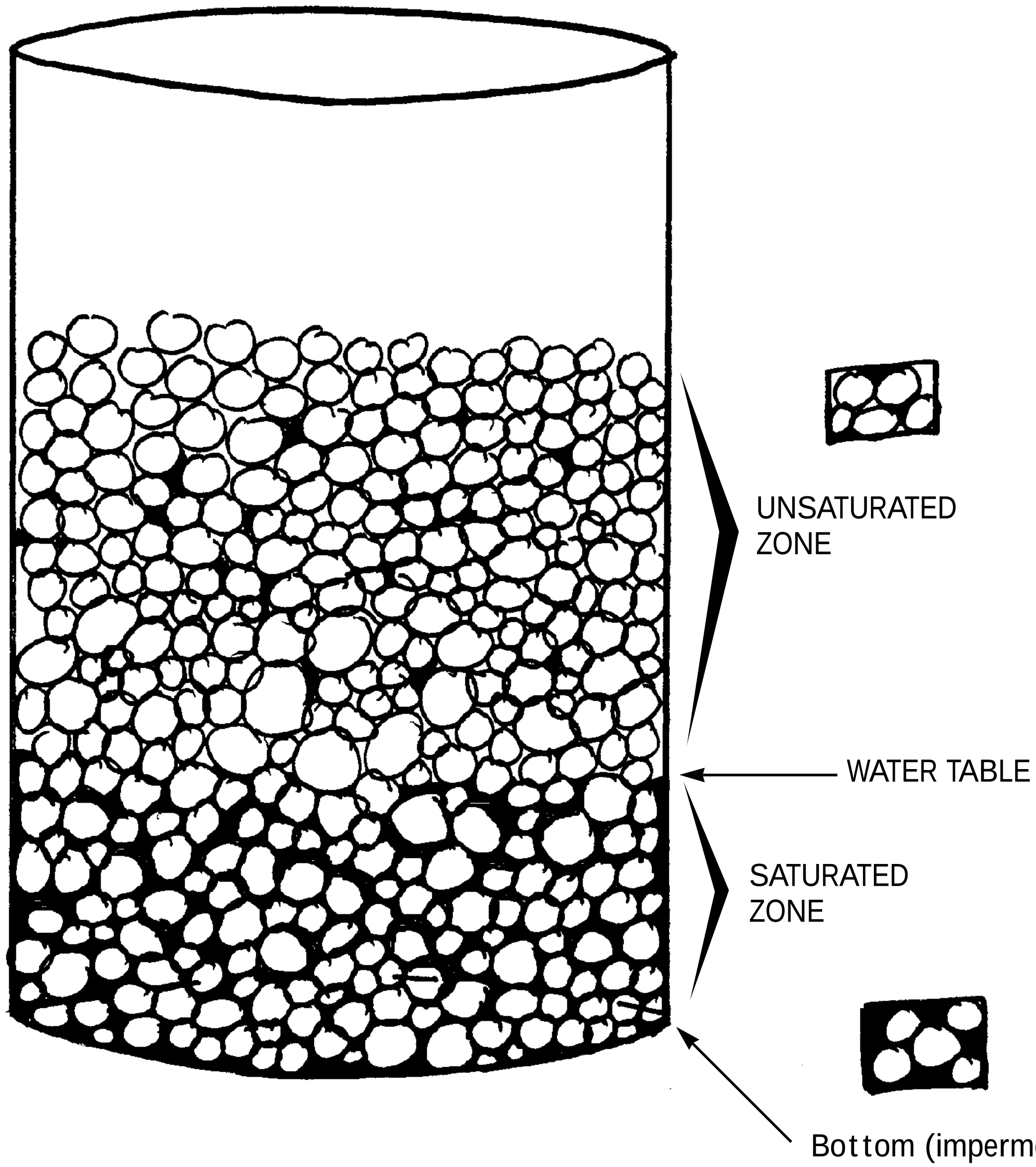
In time, ground water "resurfaces"—perhaps when it intersects with a nearby waterbody, such as a stream, river, lake, pond, or ocean; or perhaps when it emerges from a hillside as a spring or as water seeping out of a cutaway roadside rock formation. Ground water is very much a part of nature's water cycle.Another way ground water resurfaces is when it is withdrawn from the ground by way of a well. Wells are drilled and installed to capture ground water and pump it to the surface. In New England, the average depth to ground water ranges between 8-20 feet.

When pollutants leak, spill, or are carelessly discarded into and onto the ground, they, like water, move slowly or quickly through the soil, depending on the soil, the nature of the pollutant, and the amount of extra help it gets from incoming precipitation. If there is a water supply well near a source of contamination, that well runs the risk of becoming contaminated by polluted ground water. If there is a nearby river or stream, that waterbody may also become polluted by the ground water. Because it is located deep in the ground, ground water pollution is generally difficult and expensive to clean up. In some cases, people have had to find alternative sources of water because their own wells were contaminated.

GROUND WATER DIAGRAM

GROUND WATER TERMS

AQUIFER: A water-bearing soil or rock formation that is capable of yielding enough water for human use.



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TEACHING STRATEGY

NOTE: These exercises may be completed over several class periods.

Part A - Brainstorming About Ground Water

1. Have a discussion with the class about ground water so that you can get some idea of what, if any, preconceptions exist. (Many adults still think ground water exists as an underground lake or river.) Ask students to describe what they think ground water is, where it is, and how it got there. List the answers on the board or a flip chart.

2. Ask for a volunteer(s) to come to the board and draw a X-section of what he/she thinks the ground water environment might look like. Allow the students to contribute to the drawing by making suggestions or even volunteering to draw their own versions. Keep the drawings on hand so you can refer back to them when you have completed the demonstrations.

Part B -The Water Cycle Connection

1. Take your students outside onto the school grounds. Ask them to think about the last time it rained. Where did the water go when it fell on pavement? On roofs? On soil?

2. Take a cup of water, and ask a student to pretend it is rain. Have the student pour the water on unpaved ground. What happens to the water? *First, it makes a puddle. Then, it soaks into the ground.*

3. Discuss what might be happening to that water once it disappears into the soil.

Part C - Demonstrating Ground water

You may want to do this exercise as a class or as small groups.

1. Ask the students to think of the cup and sand and gravel models that they are about to make as part of a ground water system. Explain that the bottom of the cup is similar to bedrock or clay that is found beneath the earth's soil layers. Because we can't see ground water, we make models to demonstrate how it looks.

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2. Fill one clear cup(s) 3/4 full with gravel and the other(s) with sand. Ask the class to describe the spaces (pores) between the gravel and between the sand. *The gravel has bigger spaces.*

3. Pour water slowly into each of the cups until it reaches the top of the gravel or sand (not the top of the cup). Where is the water? *It has filled in the pore spaces.*

4. Explain that when we refer to ground water, we are talking about that part of the soil where all the pore spaces are filled, or saturated, with water.

5. Explain that when it rains, some of the rain (or other precipitation) flows into the soil. It moves through the spaces or pores between the particles. As water flows through the soil, it eventually reaches an impermeable layer of rock or clay and begins to fill the pore spaces of the soil.

6. Have students complete the water maze activity. This activity illustrates how water must find its way through available openings and paths in the soil structure.

7. To demonstrate where ground water (the saturated zone) begins, fill another cup(s) to nearly the top with gravel. At the edge of the cup, gently pour in the water (dyed with food coloring) until the cup is half filled with water. (If you pour the water too fast, you may have to let it "settle" for a few minutes). Tell students that the ***water table*** is the place where the soil becomes saturated and the drier sand or gravel ends. Water found below the water table is called ***ground wate***r. For older students, you may want to mention that the area above the water line is called the ***unsaturated zone***; the area that has every space filled with water is called the ***saturated zone***.(See "Ground Water Terms" diagram on page C4 with this activity.)

Part D - Well Demonstration

1. Explain to students that many people use ground water as a source of drinking water or as a source of water for crops/plants.

2. Explain that wells are used to pump water out of the ground. This demonstration shows how wells pump out ground water.

NOTES

3. Cover the bottom of the tube of a spray nozzle with a piece of nylon stocking. Secure the stocking with a rubber band.
4. Put the spray nozzle into an empty cup. Fill the cup 3/4 full with gravel. Pour water into the cup until it reaches the top of the gravel (not the top of the cup). The sprayer is used to simulate pumping water through a well.
5. Pump water through the spray nozzle into another cup or into the sink.

Follow-up Questions

1. Why did we use the stocking at the base of the spray nozzle? *To keep sand and gravel from being pumped into the tube. Real wells have screens too.*
2. How are most real wells powered? *By an electric pump.*

Part E - The Ground Water/Surface Water Connection

1. Put a layer of un-colored aquarium gravel in a clear cake pan or clear plastic salad bowl (about 3” deep). Dig a hole (depression) in the gravel, so that when water is added students can see the water table (the thoroughly wet gravel, or saturated zone, versus the area that is dry or just damp) as well as the relationship between ground water and surface water.
2. Add light blue food coloring to a pitcher of water. Gently pour the water into the pan at one edge until it saturates about 1 1/2” of the gravel throughout the pan. What happens? *Water will seep into the hole.*
3. Explain that in many parts of the country, when people dig a big hole in the ground it slowly fills up with water and becomes a man-made pond or lake. From where does the water come? *Ground water flows into the hole.*
4. Explain to students that lakes and ponds receive their water from many sources—direct rainfall and melted snow, runoff of water during storms, and ground water. Just as ground water fills a man-made lake or pond, it also moves and discharges into naturally occurring waterbodies. For grades 4-6, hand out the ground water diagram in this activity (see page C3) to show how the water table intersects with lakes and streams.

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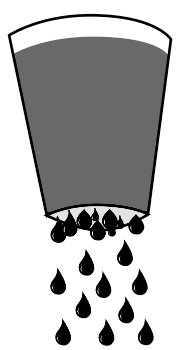
RAINCUPS



Part F - Polluting Ground Water

1. Using the ground water/pond set up from Part E, take the spray nozzle and withdraw water from the ground. (Do this in a corner away from the pond.) What happens to the water level in the pond as you withdraw more and more water? *The water level in the pond goes down.*

2. Replenish the ground water level, then place 1 tablespoon of the red Kool-Aid in one location on the ground surface, away from the pond. Make it rain by adding water using "rain cups." What happens to the pond? *Eventually, the contamination make its way into the pond.* This exercise demonstrates how ground water quality can impact surface water quality.

3. Using your spray nozzle to simulate a well, withdraw water from the ground. What happens? *As you continue to withdraw water, the contamination eventually moves into the well.* Look underneath the clear pan to see how it spreads.

Part G - Wrap-up Discussion

1. Have students review the earlier ground water brainstorming discussion to see how their answers might have changed as a result of what they now know about ground water. What have they learned?

2. How might they modify their earlier ground water X-section diagram?

Alternate Strategy

Make parts E-F more interesting and fun by having the students create whole, landscaped settings in larger see-through containers. Settings can include houses, roadways, ponds or rivers, bridges, etc. Using a spray nozzle, install a well near the home or business.

Adapted from: SEE-North. *Ground water Education in Michigan's Schools.* Petoskey, MI: Science and Environmental Education - North, 1991.

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WATER MAZE

Using a pencil, follow the paths that rain water might take as it travels down into the ground between the soil particles to the water table (the shaded area at the bottom).